PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

BCSA

Dense Concrete Blockwork

Key Information

General Process Description	This dataset represents average end-of-life conditions for dense concrete blockwork in the UK. The density of the modelled concrete block is 2000kg/m^3.
Reference Flow	1kg of dense concrete blockwork (inc. mortar)
Reference Year	2012

Modelling & Assumptions

Detailed model description

This dataset represents average end-of-life conditions for dense concrete blockwork used in a building in the UK. The reference unit is 1kg of blockwork. Users wishing to use this data to make comparisons between different structures and/or different materials should consider the amount of material required for the relevant structural function as comparing on a per kg basis may be misleading.

The modelled blocks are assumed to have a density of 2000kg/m^3. A standard block size of 100x215x440mm has been assumed with 10mm mortar joints. This gives a blockwork system that is 93.4% concrete block by volume with 6.6% mortar. The concrete blocks are assumed to be made from Portland Cement and aggregates made up of 100% primary material i.e. with no recycled content.

Recycling Rates

The recycling and landfill rates used in modelling the end of life treatment of dense concrete blockwork are as follows.

Material	***Dense Concrete Blockwork***
Recycling Rate	Recycling: 90%
	Landfill: 10%
Reference	[BRE 2012]

It was assumed that the concrete blockwork and mortar were not treated separately. In addition, no specific information regarding the recycling rate for concrete blockwork in the UK was found, so the average rate for general concrete was used. Concrete blockwork is not generally reused, as blocks cannot be easily separated from each other and the cement mortar.

Module Description

The dataset includes the following waste processing steps (EN 15804 module code shown in brackets):

	- **Demolition (C1):** Demolition has been modelled based on information related to the demolition of office building structural systems [Athena 1997]. The cited report listed energy demands from diesel for the demolition of concrete, wood and steel-based structural frames. Energy demand varies depending on the type of building element being demolished. The energy required for demolishing concrete blockwork was based on the energy requirements for the demolition of walls (both internal and external), as this is one of the main applications of concrete blockwork. Overall, the average energy demand for demolition from diesel was calculated to be 0.058 MJ/kg. - **Transport of Concrete (C2):** Transport distances for concrete blocks are based on average transport distances for waste concrete to waste transfer stations or directly to recycling centres and landfill [BRE 2012]. Using these figures, the distance for concrete blocks sent to recycling was assumed to be 20km. For waste sent to landfill this was 22km. Transport was assumed to be in industrial waste skips (>12m3 up to 20t), with skips unloaded on the outward journey and fully loaded on the return. - **Concrete/mortar crushing (C3):** Concrete crushing is based on a generic crusher used for processing construction rubble. The overall loss rate of the crusher used for modelling this process was 3.1% - **Landfill of concrete/mortar (C4):** The dataset used for modelling the landfill of concrete represents the environmental profile of inert waste in a typical European municipal waste landfill. - **Benefits/Loads associated with rec. concrete/mortar (D):** Crushed concrete generated from the recycling process can be used as aggregates or fill materials for a number of construction applications including road building or as an aggregate for fresh concrete. To reflect the potential benefits associated with using crushed concrete in place of virgin aggregates, an average was made of different rocks used in construction applications (including road building) using information from the Office of National Statistics related to quantities of minerals extracted in Great Britain in 2010 [ONS 2011]. Included in this average were limestone, igneous rock, unspecified mixed crushed rock, sand and gravel.

Representativeness

Time representativeness	Recycling rates and other assumptions are based on the most recent data available, the oldest of which was published ten years ago. Background data is for the year 2013.
Geographical Representativeness	The methods and rates modelled are based on research of concrete materials in the UK. Background datasets are UK specific, EU average or Global average (see included datasets list) where possible. Some German datasets have been used but are deemed broadly representative of UK or European technology for the processes or materials they represent
Technological Representativeness	All technological processes deemed relevant for waste treatment of concrete blockwork in the UK have been modelled.

Included Datasets

Dataset List	
	GB: Thermal Energy from Light Fuel Oil
	EU-27: Diesel Mix
	Global: Euro 5 Truck, 9.3t payload capacity
	Global: Euro 5 Truck, 22t payload capacity
	DE: Processing Facility (Construction Rubble)
	EU-27: Lubricants
	EU-27: Wax/Paraffin
	EU-27: Light Fuel Oil
	EU-27: Landfill of inert waste
	EU-27: Landfill of inert matter (steel)
	RER: Gravel 2/32
	RER: Sand 0/2
	DE: Limestone, crushed
	DE: Lava granulate
	DE: Crushed Rock 16-32mm

Conformity with EN 15804

The models used in this work have been designed to be conformant with the EN 15804 standard and all upstream datasets used are also conformant with the standard.

Both the model and results have been produced in line with the EN 15804 standard and have undergone quality assurance by experts within PE INTERNATIONAL. However, no formal review process through a third party has been undertaken therefore the results are unverified.

Environmental Parameters Derived from the LCA

Parameters describing environmental impacts		C1	C2	C3	C4	D
Global Warming Potential	kg CO2 eq.	0.0048	0.0017	0.0024	0.0014	-0.0053
Ozone Depletion Potential	kg CFC11 eq.	3.28E-15	8.04E-15	3.41E-14	1.84E-14	-3.55E-13
Acidification Potential	kg SO2 eq.	9.70E-06	5.31E-06	1.81E-05	8.62E-06	-1.99E-05
Eutrophication Potential	kg PO4 eq.	1.90E-06	1.13E-06	3.94E-06	1.18E-06	-3.85E-06
Photochemical Ozone Creation Potential	kg Ethene eq.	8.80E-07	-1.55E-06	2.52E-06	8.09E-07	7.31E-09
Abiotic Depletion Potential (elements)	kg Sb eq.	5.28E-11	6.33E-11	3.58E-09	5.10E-10	-7.47E-10
Abiotic Depletion Potential (fossil)	MJ	0.066	0.023	0.046	0.018	-0.063

Parameters describing primary energy		C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	5.58E-05	9.13E-04	1.44E-03	1.54E-03	-1.02E-02
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0	0	0
Total use of renewable primary energy resources	MJ, net calorific value	5.58E-05	9.13E-04	1.44E-03	1.54E-03	-1.02E-02
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ, net calorific value	0.066	0.023	0.047	0.019	-0.075
Use of non-renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0	0	0
Total use of non-renewable primary energy resources	MJ, net calorific value	0.066	0.023	0.047	0.019	-0.075
Use of secondary material	kg	0	0	0	0	0.873
Use of renewable secondary fuels	MJ, net calorific value	3.26E-07	1.49E-07	0	3.33E-05	-9.79E-06
Use of non-renewable secondary fuels	MJ, net calorific value	3.41E-06	1.56E-06	0	7.20E-05	-2.99E-05
Net use of fresh water	m^3	3.08E-07	6.44E-07	1.10E-05	-7.11E-05	-1.66E-04

Other environmental information describing waste categories		C1	C2	C3	C4	D
Hazardous waste disposed	kg	6.44E-08	5.30E-08	6.19E-07	8.36E-07	-1.16E-05
Non-hazardous waste disposed	kg	8.05E-06	2.92E-06	2.01E-05	1.00E-01	-2.63E-02
Radioactive waste disposed	kg	-6.11E-08	-3.04E-08	-4.95E-07	-3.25E-07	4.80E-06

Other environmental information describing output flows		C1	C2	C3	C4	D
Components for re-use	kg	0	0	0	0	0
Materials for recycling	kg	0	0	0.873	0	0
Materials for energy recovery	kg	0	0	0	0	0
Exported energy	MJ per energy carrier	0	0	0	0	0

References

Athena 1997	Athena Sustainable Materials Institute, 1997. *Demolition Energy Analysis of Office Building Structural Systems.*
BRE 2012	Anderson, J., Adams, K. and Shiers, D., 2012. *Minimising the Environmental Impact of Construction Waste*. In press. BRE: Watford
BS EN 15804:2012	British Standards Institution, 2012. *BS EN 15804:2012 Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products. London: BSI*
ONS 2011	Office for National Statistics, 2011. *Mineral Extraction in Great Britain - 2010.* Newport: ONS